Remarks/Arguments

Reconsideration of this application is requested.

Claim Status

Claims 1-4 were previously presented and remain pending. Claim 1 is amended.

Claim Rejections – 35 USC 103(a)

Claims 1-4 are rejected under 35 USC 103(a) as obvious over Sakemi (US 5,890,283) and as obvious over Nakazato (US 5,768,775). Applicant notes that the relevant portions of Sakemi are essentially identical to the relevant portions of Nakazato. Therefore, the references are considered together in the following remarks.

Independent claim 1 is further amended to distinguish over Sakemi and Nakazato. In particular, claim 1 is amended to recite:

> ...a mounting mechanism for mounting said balls on the workpiece, wherein the total of the weight of said head and a pressure applied by the cylinder counterbalances the energized force by said energized force generating device, and said head does not come in contact with the lower positioning stop and an upper positioning stop when said balls are mounted.

Thus, in the present invention, a state is achieved in which the weight of head 4 *and* the pressure applied by cylinder 15 counterbalances the force applied by spring member (energized force generating device) 16. This counterbalanced state, which is illustrated in Fig. 4, is an *unclamped* state in which head 4 is not in contact with either lower positioning stop 18 or upper positioning stop 19.

During this unclamped and counterbalanced state, steps 4, 10 and 26 are performed. In step 4 (after unclamping in step 3), balls 2 are sucked up to head 4. In step 10 (after unclamping in step 9), head 4 is lowered slowly until flux 27 applied on the lower parts of balls 2 touches workpiece 12. In step 26 (after unclamping in step 25), the mounting step, balls 2 held by head 4 are dipped into

flux 27 printed on workpiece 12. Thus, during the mounting step (step 26), claim 1 requires a mounting mechanism in which the spring counterbalances the weight of the head and the pressure applied by the cylinder so that the head does not contact either the lower or upper positioning stop.

Sakemi/Nakazato do not have a mounting mechanism for mounting balls on the workpiece as recited in amended claim 1. That is, Sakemi/Nakazato have no mounting mechanism in which, when the balls are mounted, the spring counterbalances the weight of the head and the pressure applied by the cylinder so that the head does not contact either the lower or upper positioning stop. The only state of counterbalance that is described by Sakemi/Nakazato is when cylinder 38 *is applying no pressure* and the spring tension of springs 40 is equal to the weight of case 31 and attracting tool 32 (see Sakemi, col. 4, lines 31-32). This state does not occur while the balls are being mounted on the workpiece as is required by claim 1.

In Sakemi/Nakazato, when attracting tool 32 is lowered vertically to adhere flux 2 to solder balls 1, there is no state of counterbalance between the spring and the head + cylinder pressure. Instead, spring 40 equals the weight of attracting tool 32, and the force of cylinder 38 therefore pushes attracting tool 32 down (see Sakemi, col. 5, lines 9-18). Thus, the head + cylinder pressure *exceeds* the force of the spring and there is no counterbalance during this state. Similarly, during the operation of mounting solder balls 1, the head + cylinder pressure again exceeds the force of the spring to cause attracting tool 32 to move downwards towards electrodes 12. When solder balls 1 reach electrodes 12, attracting tool 32 slightly rises with respect to box 30 *and the underside of case 31 detaches from touch sensor (lower positioning stop) 43.*

Thus, in Sakemi/Nakazato, when the balls are being mounted, there is no counterbalance between the spring and head + cylinder pressure, as is required by amended claim 1. Moreover, during a portion of the mounting process, the head is in contact with the lower positioning stop, as is prohibited by amended claim 1.

This is indicated by the fact that case 31 (head) detaches from touch sensor 43 (lower positioning stop) during the process.

Since Sakemi/Nakazato do not teach or suggest a mounting mechanism for mounting balls on a workpiece as recited in amended claim 1, claim 1 and claims 2-4 dependent thereon are not obvious in view of Sakemi/Nakazato. The rejections under 35 USC 103 should be withdrawn.

Conclusion

This application is now believed to be in condition for allowance. The Examiner is invited to telephone the undersigned to resolve any issues that remain after entry of this amendment. Any fees due with this response may be charged to our Deposit Account No. 50-1314.

Respectfully submitted,
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